

## PATENT ABSTRACTS OF JAPAN

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### (54) BIODEGRADABLE RESIN

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a new reinforced biodegradable resin and a usage thereof.

SOLUTION: The biodegradable resin is produced by reinforcing a biodegradable resin such as a polylactic acid by both natural fiber and natural fiber yarn. This reinforced biodegradable resin is widely usable, for example as a mean of connecting a plural of members. The biodegradable resin is usable as connecting members of a bolt/nut, screw, rivet, fastener, clip, other than adhering.

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**CLAIMS**

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[Claim(s)]

[Claim 1] Biodegradability resin reinforced by the natural fiber and natural fiber yarn.

[Claim 2] Biodegradability resin according to claim 1 with which said natural fiber has die length of 5-20mm, and the diameter of 10-30 micrometers.

[Claim 3] Biodegradability resin according to claim 1 or 2 with which said natural fiber yarn has the diameter of 200-500 micrometers.

[Claim 4] Said biodegradability resin and biodegradability resin given in any 1 term of claims 1-3 whose ratios with the sum total of a natural fiber and natural fiber yarn are 7:3-3:7.

[Claim 5] The compound member using biodegradability resin given in any 1 term of claims 1-4 as physical joint material.

[Claim 6] The compound member using biodegradability resin given in any 1 term of claims 1-4 as adhesives.

[Claim 7] The compound member which consists of two or more members joined by the junction means using biodegradability resin.

[Claim 8] The compound member according to claim 7 said whose junction means is a physical junction means.

[Claim 9] The compound member according to claim 8 in which said junction means has the configuration of a bolt/nut, a screw, a rivet, a fastener, or a clip.

[Claim 10] The compound member according to claim 8 said whose junction means are adhesives.

[Claim 11] Composite material given in any 1 term of claims 7-10 whose quality of the material of said junction means is polylactic acid or reinforced polylactic acid.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the use as a means for the biodegradability resin reinforced with the natural fiber ingredient, and its use, for example, junction of two or more members.

[0002]

[Description of the Prior Art] Development of biodegradability resin which carries out decomposition disappearance in natural environment on the occasion of the cast away after use is furthered. However, improvement in a mechanical strength is called for in a certain kind of biodegradability resin, and what was reinforced with the natural fiber is known (JP,7-266751,A). However, for fiber [ having opened the natural fiber ], the trouble that the ratio of the fiber which fiber round-head-feels easy, breaks and bends, and does not contribute to reinforcement increased existed.

[0003] On the other hand, in the compound member which joins two or more members and changes, although it was important to disassemble it to each part material at the time of the cast away because of subsequent processing, the trouble that it was not necessarily easy to separate a member existed.

[0004]

[Problem(s) to be Solved by the Invention] Therefore, this invention offers the biodegradability resin reinforced more strongly than the conventional thing. This invention offers the composite material which joins two or more members with biodegradability resin, and changes again.

[0005]

[Means for Solving the Problem] this invention persons found out that the biodegradability ingredient which has a high mechanical strength, and decomposes and disappears easily in natural environment at the time of abandonment was obtained at the time of use by mixing the piece of yarn of a natural fiber in biodegradability resin further only in addition to a natural fiber as the charge of reinforcing materials, as a result of examining above-mentioned The means for solving a technical problem. Therefore, this invention offers the biodegradability resin reinforced by the natural fiber and natural fiber yarn.

[0006] It found out that it had mechanical strength sufficient at the time of use, each part material could be easily separated at the time of the cast away, and abandonment processing could be separately carried out when this invention persons use biodegradability resin, for example, the biodegradability resin reinforced like the above, again as a junction means of two or more members (it does not ask whether it is biodegradability resin). Therefore, this invention offers the composite material which used two or more members as a chemical adhesion agent as a physical coupling means which consists of biodegradability resin, and was joined.

[0007]

[Embodiment of the Invention] The biodegradability resin of this invention and especially the application of composite material cannot be limited, can be applied to various industrial products, household articles, etc., for example, can be used as autoparts. Although it cannot be limited especially as a biodegradability resin raw material used in this invention, various biodegradability resin ingredients can be used, for example, polyvinyl alcohol, the poly caprolactone, polylactic acid, polybutylene

succinate, etc. can be mentioned, it is not limited to these.

[0008] As a natural fiber used by this invention, although hemp (a ramie, a jute, linen, Manila hemp), cotton, a kenaf, silk, wool, etc. are mentioned, you may be any, such as an animal fiber, vegetable fiber, and microorganism nature fiber, that what is necessary is just the natural fiber by which is not limited to these but biodegradation may finally be carried out. The die length of a natural fiber has 0.1mm - 50 desirablenmm, and 1 micrometer - 50 micrometers of a diameter are desirable. Moreover, especially from the point of the reinforcement effectiveness, a thing with a die length [ of 5mm - 20mm ] and a diameter of 10 micrometers - 30 micrometers is desirable.

[0009] As natural fiber yarn, yarn and the thing which it can be preferably made twist yarn, can make through a general spinning process, and is the diameter of 200 micrometers - 500 micrometers are desirable in the above-mentioned natural fiber, and what is 300 micrometers - 400 micrometers is especially desirable, for example. If the diameter of natural fiber yarn is too thick, compound with biodegradation resin becomes difficult, and like [ when too thin ] the natural fiber before making it yarn, it will be round, or it will break and bend, and the reinforcement effectiveness will become is hard to be demonstrated. Natural fiber yarn is preferably cut and used for 10mm - 30mm 5mm - 50mm, for example. Short \*\* past \*\* and the reinforcement effectiveness are not acquired, but even if too long, it round-head-feels easy, and it bends and the reinforcement effectiveness is hard to be acquired.

[0010] The weight ratios of a natural fiber and natural fiber yarn are 8:2-2:8, and are 6:4-4:6 preferably. If there are too few ratios of natural fiber yarn, the reinforcement effectiveness will not be acquired, but if many [ too ], shaping I and surface smooth nature will worsen. If the weight ratio of a biodegradability resin raw material and the sum total of a natural fiber and natural fiber yarn has the desirable range of 7:3-3:7 and there are too many ratios of a biodegradability resin raw material, it runs short of the reinforcement effectiveness, and if there are too few ratios of another side biodegradability resin, it will serve as poor wet.

[0011] This invention relates to the compound member which joined two or more members with biodegradability resin again. This junction means is a means of the daily use for joining two or more members, such as the shape of a bolt/nut, \*\*\*\*, a rivet, a fastener, and a clip. Or junction means may be adhesives which are chemical junction means. In this case, although adhesives can be configurations, such as the shape of the shape of a liquid and a film, and a sheet, and change with classes of resin as the adhesion approach, they are performed by thermal melting arrival, heat curing, etc.

[0012] You may be biodegradability resin which could also use polyvinyl alcohol, the poly caprolactone, polylactic acid, polybutylene succinate, etc. independently, for example, or was reinforced like the above as biodegradability resin of a junction means. Since basic conditions are easy to decompose, polylactic acid is especially desirable.

[0013]

[Example] Next, an example explains this invention still more concretely.

50 % of the weight of polylactic acid was mixed as example 1. biodegradability resin, 20 % of the weight (the diameter of 200 micrometers - 500 micrometers, die length of 25mm) of hemp throwing was mixed as a vegetable fiber as 30 hempen % of the weight (die length of 1mm - 40mm, diameter of 10 micrometers - 30 micrometers) of fiber and vegetable fiber yarn, and after carrying out thermofusion, cooling solidification was carried out, pressurizing so that it may become the shape of a sheet with a thickness of 2mm. this sheet -- flexural strength 38MPa and bending elastic-modulus 1100MPa it was .

[0014] 50 % of the weight of polylactic acid was mixed as example 2. biodegradability resin, 30 % of the weight (the diameter of 200 micrometers - 500 micrometers, die length of 20mm) of hemp throwing was mixed as a vegetable fiber as 20 hempen % of the weight (die length of 1mm - 40mm, diameter of 10 micrometers - 30 micrometers) of fiber and vegetable fiber yarn, and after carrying out thermofusion, cooling solidification was carried out, pressurizing so that it may become the shape of a sheet with a thickness of 2mm. this sheet -- flexural strength 55MPa and bending elastic-modulus 1450MPa it was .

[0015] 50 % of the weight of polylactic acid was mixed as example of comparison . biodegradability resin, 50 % of the weight (die length of 1mm - 40mm, diameter of 10 micrometers - 30 micrometers) of hempen fiber was mixed as a vegetable fiber, and after carrying out thermofusion, cooling solidification

was carried out, pressurizing so that it may become the shape of a sheet with a thickness of 2mm. This sheet is flexural strength 18MPa and bending elastic-modulus 480MPa. It had.

[0016] As shown in A of example 4. drawing 1 , the member 1 and the member 2 were joined with the bolt / nut 3. The quality of the material of a bolt/nut was the reinforced same product made from polylactic acid as having prepared in the example 2.

[0017] As shown in B of example 5. drawing 1 , the member 4 and the member 5 were pasted up with adhesives 6. Thermal melting arrival of the polylactic acid sheet was inserted and carried out among members 4 and 5 as adhesives.

[0018] 7 is the body of a console attached in the car, 8 is the cover of a console, example 6. drawing 2 is the example which applied this invention to the mounted console, and foam 9 and epidermis 10 are pasted [ it has plastics foam 9 and the epidermis 10 for designs, and ] up with the biodegradability adhesives 11 which consist of polylactic acid. On the other hand, the connection objects 12 and 13 between the body 7 of a console and a cover 8 are attached with the screw 14 which consists of biodegradability resin.

[0019] By immersing the whole console in basic liquid at the time of the cast away, the biodegradation resin section collapses, the body of a console, the body of a cover, and epidermis are separated, abandonment processing is carried out separately, respectively, and biodegradation resin material is decomposed by the microorganism into the natural environment of a disposal field in that case.

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